REMARKS

Initially, Applicant's undersigned attorney expresses appreciation to the Examiner for the courtesy extended during telephone interviews on December 1, 2005 and December 8, 2005.

In the Office Action mailed December 15, 2005, the Examiner rejected Claims 1-6, 11-15 and 18-21 under 35 U.S.C. §103(a), based upon the newly-cited Japanese Reference No. 95090 of *Sato, et al.* Further, claims 1-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,267,221 to *Miller, et al.*, Claims 15-17 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Miller, et al.* in view of U.S. Patent No. 5,920,972 to *Palczewska*, and Claims 18-29 were rejected as being unpatentable under *Miller, et al.* in view of U.S. Patent No. 6,546,803 to *Ptchelintsev et al.* Applicant submits that all pending claims are allowable over the art.

In particular, Independent Claims 1 and 22 are each directed to an ultrasound probe that includes a support member comprising an acoustic dampening material, a signal cable having a plurality of electrically conductive members/wires extending continuously along the length of said cable, and an ultrasound transducer array having a plurality of transducer elements supportably mounted to a first side of the acoustic dampening support member. Of importance:

> (i) a distal end portion of each of the plurality of electrically conductive members/wires of the signal cable is embedded within and continuously extends into and through the acoustic dampening support member to a first side from a second side thereof, and
>
> (ii) a flexible primary portion <u>of the same signal cable</u> extends proximally away from the second side of the acoustic dampening support member with said plurality of electrically conductive members/wires being electrically separated in the flexible primary portion by an electrically non-conductive material.

Of further importance, a plurality of transducer elements comprising the ultrasound transducer array are <u>electrically, directly and fixedly interconnected to the distal end of corresponding different ones</u> of the plurality of electrically conductive members/wires at the first side of the support member. To emphasize, each of the electrically conductive members/wires of the signal cable comprising the ultrasound probe of Claims 1 and 22 extends:

> (i) <u>continuously</u> from a proximal end of the flexible primary portion of the signal cable,
>
> (ii) <u>continuously</u> into the second side of the acoustic dampening support member, and

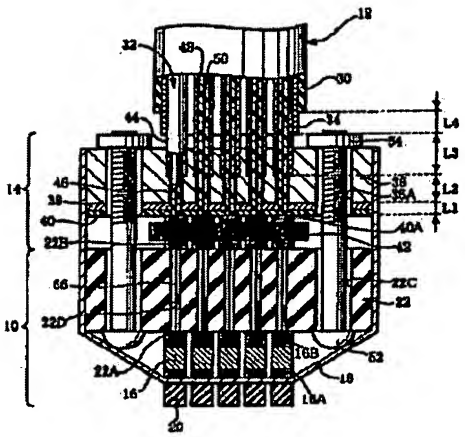
(iii) continuously through the acoustic dampening support member to a distal end at the first side of the support member that is electrically, directly and fixedly interconnected to a corresponding ultrasound transducer array element.

The cited art fails to disclose or render obvious the noted features of the ultrasound probe of Claims 1 and 22.

In particular, *Sato, et al.* fails to disclose an ultrasound probe comprising a signal cable having a plurality of electrically conductive members that extend through an acoustic dampening support member, much less an ultrasound probe in which the plurality of electrically conductive members are electrically, directly and fixedly interconnect at a distal end to corresponding different ones of a plurality of transducer elements comprising an ultrasound transducer array. In this regard, and for the Examiner's convenience, Applicant has attached hereto in **Appendix A** a translation of the *Sato, et al.* reference that was obtained from the Japanese Patent Office website.

Of initial note, and with reference to FIG. **2** of *Sato, et al.* reproduced below, it is respectfully pointed out that in *Sato, et al.* the vibrator unit **10** is not directly connected to the conductor cable **12**. Rather, a portion of the connection unit **14** is interposed therebetween and thereby renders *Sato, et al.* clearly distinguishable from the present invention.

More particularly, and with reference to FIG. **2** of *Sato, et al.* reproduced below, the inner conductor **50** of each cable **32** of conductor cable **12** terminates at the face of electrode substrate **40** and is offset from the vibrator unit **10** by electrode pad **40A**, anisotropy conductive member **42** and electrode pad **40B**. In this regard, it is critical to understand that electrode pads **40A** and **40B** are not part of the vibrator unit **10**. Rather, the vibrator unit **10** comprises piezoelectric devices **16** having an electrode layer **16A** located on one side thereof and electrode layers **16B** and **22A** located on the other side thereof.



In short, in the illustrated embodiment of *Sato, et al.*, four intervening, electrically conductive elements are interposed between the end of each inner conductor **50** of conductor cable **12** and the ultrasound transducer elements of vibrator unit **10** (i.e., electrode pad **40A**, anisotropy conductive member **42**, electrode pad **22B** and leader line **56**). In the latter regard, it should be understood that leader lines **56** extend through the backing **22** of the vibrator unit **10**, as opposed to the inner conductor **50** of each cable **32** comprising conductor cable **12**. In fact, connector unit **14** is specifically manufactured to define standing ways **36** positionable about inner conductors **50**, such standing ways **36** being offset from backing **22**. The *Sato, et al.* arrangement is clearly different then the ultrasound probe of independent Claims 1 and 22 and represents yet another example of the prior art that Applicant has made an improvement over.

Indeed, while *Sato, et al.* goes to significant effort to provide a connection unit **14** having intervening electrode layer **40A**, anisotropy conductive member **42** and electrode layer **22B**, Applicant's invention does not include such componentry, and further does not require the inclusion of separate leader line **56** elements. Rather, in Applicant's claimed ultrasound probe, electrically conductive members/wires of a signal cable extend continuously from a proximal end of a proximal portion of a signal cable, continuously into a second side of an acoustic dampening support member, and continuously through the acoustic dampening support member to distal ends that are each electrically, directly and fixedly interconnected to a corresponding ultrasound transducer array element.

The cited reference of *Miller, et al.* also fails to disclose or suggest Applicant's inventive ultrasound probe, including inter alia, a signal cable comprising a plurality of electrically conductive

members/wires that extend continuously from a proximal end of the flexible primary portion of the signal cable, continuously into the second side of the acoustic dampening support member, and continuously through the acoustic dampening support member to a distal end at the first side of the support member that is electrically, directly and fixedly interconnected to a corresponding ultrasound transducer array element. In this regard, in the Summary section, *Miller, et al.* states that:

> [T]his invention provides a transducer assembly which includes an acoustic transducer array, an electric circuit element and a backing for interfacing the array with the circuit element. . . . The acoustic transducer array may be a one-dimensional or two-dimensional array of transducer elements, each of which elements has a first acoustic impedance, a rear face and an electrical contact at its rear face. The circuit element has a contact for each transducer element. The backing consists of a block . . . . At least one electrical conductor for each transducer element extends through the block between the top and bottom faces thereof. . . . [T]he backing includes a means for effecting electrical contact between the circuit contact for each transducer element and the corresponding at least one electrical conductor. (Emphasis added.) *Col. 2, lines 44-45, lines 51-57, Col. 3, lines 3-5, lines 13-16.*

Clearly, such language contemplates a transducer assembly in which separate circuit elements contact separate backing electrical conductors, via a backing means for effecting electrical contact, and the backing electrical conductors contact transducer elements. As to the "backing means for effecting electrical contact" the Summary states:

> [A] pattern of electrical contacts substantially matching the circuit element contact pattern may be formed on the bottom face of the backing. It is also possible for each electrical conductor to extend beyond the bottom face of the block and to be physically and electrically connected to a corresponding electric circuit contact. (Emphasis added.) *Col. 4, lines 24-30.*

Of note, the establishment of physical contact between separate elements (i.e. circuit element contacts and backing electrical conductors) is taught by *Miller, et al.*, as opposed to the provision of continuously extending electrically conductive members/wires of a signal cable, as per Applicant's Claims 1 and 22. This distinction is further evidenced by the embodiments described in the Detailed Description of *Miller, et al.*, which states with reference to FIG. **4** reproduced below:

> FIGS. **2** and **3** show embodiments of the invention for two-dimensional and one dimensional acoustic transducer arrays, respectively. The transducer array **25.1** shown in FIG. **3** is

substantially the same as the assembly shown in FIG. **1** with a transducer array **15.1** and a printed circuit board.... FIGS. **4-9** show small portions of illustrative embodiments of transducer assemblies **25** suitable for use as the assemblies **25.1** or the assembly **25.2** in FIGS. **3** and **2**, respectively. Referring first to FIG. **4**, it is seen that backing **27** is formed of a block **37** of an acoustic energy attenuating material, which block has electrical conductors **39** extending from top surface **31** to bottom surface **33**. . . . For the embodiment shown in FIG. **4**, it is assumed that both top surface **31** and bottom surface **33** have been initially metalized with a conductive material and that the metal is then etched away . . . to leave contacts **35** on top face **31** in physical and electrical contact with conductors **39** projecting from block **37**, and to leave electrical contacts **41** on the bottom surface **33** which are in physical and electrical contact with conductors **39** at surface **33**. . . . The transducer array **15**, circuit board **19** and backing **27** are then assembled . . . with contacts **41** in physical and electrical contact with contacts **22** on board **19**. An epoxy or other suitable adhesive may be applied to either one or both surfaces to be brought together, . . . the layer of adhesive . . . between adjacent contacts **22** and **41** being sufficiently thin . . . so as not to provide significant electrical or acoustic impedance at these junctions. (Emphasis added.) *Col. 4, lines 59-64 through Col. 5, lines 48-49, lines 52-55, lines 60-65.*

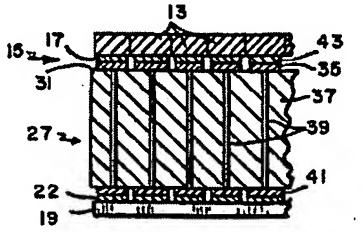


FIG. 4

In short, in the noted embodiments, electrical contact between circuit board **19** and transducer array **15** is achieved by physical contact between separately provided contacts **22** on board **19** and contacts **41** on the bottom surface **33** of block **37** (e.g. across a thin adhesive layer); physical contact between

separately provided conductors **39** of block **37** and contacts **41** thereof; and physical contact between conductors **39** and transducer array **15.**

In relation to the only other embodiment described, *Miller, et al.* states:

> FIG. **5** also illustrates another alternative in the construction of this invention in that contacts **22** and **41** have been replaced by extending conductors **39** beyond the end of block **37**, and by passing these extended conductors through plated-through holes **45** in circuit board **19** and securing the extended leads in the plated-through holes by standard techniques known in the art, such as soldering. (Emphasis added.) *Col. 8, lines 36-43.*

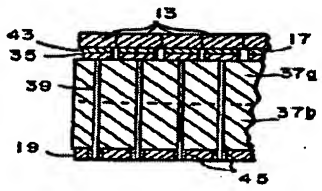


FIG. 5

In this embodiment, electrical contact between circuit board **19** and transducer elements **13** (i.e. transducer array **15**) is achieved by physical contact between separately provided plated-through holes **45** in circuit board **19** and conductors **39** of block **37** that separately pass through and secure within the plated-through holes **45** of circuit board **19**, e.g. by soldering.

As may be appreciated, the above-noted aspects of the described embodiments of *Miller, et al.* correspond with the "backing means for effecting electrical contact" contemplated by the Summary section thereof. In each case, a physical interface between a separately provided circuit element contact and backing electrical conductor is utilized, in contradistinction to the ultrasound probes of Claims 1 and 22. This fact is in no way obviated by language in *Miller, et al.* that states that:

> The circuit element may be a printed circuit board, flexible cable, semiconductor element . . . or other element to which electrical contact may be made. . . . The circuit element has a contact for each transducer element. *Col. 2, lines 47-57.*

While the noted language of *Miller, et al.* contemplates that the circuit element may be a flexible cable, it is also consistent with the above-referenced teachings that require the inclusion of separate backing electrical conductors and circuit element contacts.

Similarly, such requirement is consistent with the language of *Miller, et al.* that states that:

> The transducer array **25.1** shown in FIG. **3** is substantially the same as the assembly shown in FIG. **1** with a transducer array **15.1** and a printed circuit board, strip, cable, semiconductor element . . . or the like **19.1** (hereinafter "circuit element") having leads **11** formed thereon. Where contact is made directly to a semiconductor element, and in other selected applications, leads **11** may not be employed. The difference is in backing **27.1** between the transducer array and the circuit board which has leads (not shown) embedded therein. Contacts **29.1** are provided on circuit element traces **11** to facilitate connection. *Col. 4, line 61 - Col. 5, line 4.*

Such language corresponds with the two alternate "backing means for effecting electrical contact" discussed above, each of which requires separately provided, physical interconnection interfaces between the contacts **22**/through holes **45** of circuit element **19** and block conductors **39**. Indeed, the noted distinguishing feature and required element of *Miller, et al.* is even stipulated in the independent claims of *Miller, et al.*

Again, such separately provided, physical interconnection is distinguishable from the ultrasound probes of Claims 1 and 22, which utilize a signal cable having a plurality of electrical conductors/wires that extend continuously from a proximal end of the flexible primary portion of the signal cable, continuously into the second side of the acoustic dampening support member, and continuously through the acoustic dampening support member to distal ends at the first side of the support member that are electrically, directly and fixedly interconnected to corresponding ultrasound transducer array elements.

For the record, Applicant notes that it is clear that the prior art must teach or otherwise motivate a combination of prior art references. For example, in the CAFC decision of *In re Anita Dembiczak and Vincent Zinbarg, 175 F.3d 994, U.S.P.Q.2D (BNA) 1614 (Fed. Cir. 1999)* the Court stated:

> Our case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the

requirement for a showing of the teaching or motivation to combine prior art references. See, e.g., *C.R. Bard, Inc. v. M3 Sys., Inc., 157 F.3d 1340, 1352, 48 U.S.P.Q.2D (BNA) 1225, 1232 (Fed. Cir. 1998)* (describing "teaching or suggestion or motivation [to combine]" as an "essential evidentiary component of an obviousness holding"); *In re Rouffet, 149 F.3d 1350, 1359, 47 U.S.P.Q.2D (BNA) 1453, 1459 (Fed. Cir. 1998)* ("the Board must identify specifically...the reasons one of ordinary skill in the art would have been motivated to select the references and combine them"); *In re Fritch, 972 F.2d 1260, 1265, 23 U.S.P.Q.2D (BNA) 1780, 1783 (Fed. Cir. 1992)* (examiner can satisfy burden of obviousness in light of combination "only by showing some objective teaching [leading to the combination]"); *In re Fine, 837 F.2d 1071, 1075, 5 U.S.P.Q.2D (BNA) 1596, 1600 (Fed. Cir. 1988)* (evidence of teaching or suggestion "essential" to avoid hindsight); *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 297, 227 U.S.P.Q. (BNA) 657, 667 (Fed. Cir 1985)* (district court's conclusion of obviousness was error when it "did not elucidate any factual teachings, suggestions or incentives from this prior art that showed the propriety of combination"). See also *Graham, 383 U.S. at 18, 148 U.S.P.Q. (BNA) at 467* ("strict observance" of factual predicates to obviousness conclusion required). Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight. See, e.g., *Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1138, 227 U.S.P.Q. (BNA) 543, 547 (Fed. Cir. 1985)* ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time."). In this case the Board fell into the hindsight trap.

Applicant submits that in the present case the Examiner's reliance on either *Sato, et al.* or *Miller, et al.* to reject Claims 1 and/or 22 is the result of inappropriate hindsight analysis and, for the various reasons noted above, Applicant respectfully requests withdrawal of claim rejections based thereupon.

In view of the foregoing, Applicant submits that independent Claims 1 and 22 are allowable over the art. Applicant further submits that dependent Claims 2-21 and 23-29 are allowable for the same reasons noted above, and further since such claims present further inventive combinations not disclosed or rendered obvious by the prior art.

Based upon the foregoing, Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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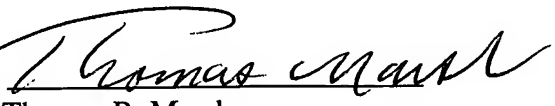
By: 

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